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10/590,039	08/02/2007	Markku Renfors	915-007.208	5506

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EXAMINER

NGUYEN, LEON VIET Q

ART UNIT	PAPER NUMBER
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2611

MAIL DATE	DELIVERY MODE
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10/13/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/590,039

Applicant(s)

RENFORIS ET AL.

Examiner

LEON-VIET Q. NGUYEN

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 April 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-43 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 August 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/18/06, 9/11/06, 4/28/06</u> . | 6) <input type="checkbox"/> Other: _____. |

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 4/28/08 was filed after the mailing date of 4/28/08. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Drawings

1. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 3, 11, 15, 17, 25, 29, 31, 39 and 43 are rejected under 35

U.S.C. 102(b) as being anticipated by Tapia et al (US5555285).

Re claim 1, Tapia discloses a method for use in an equalization of a channel by means of an equalizer, wherein said channel uses a certain frequency band for a transfer of signals (col. 23 lines 35-43), said method comprising:

determining a channel response for at least one frequency point within said frequency band used by said channel (col. 23 lines 44-59, col. 24 lines 31-39, col. 25 lines 45-55); and

setting at least one adjustable coefficient of said equalizer (col. 23 lines 35-43, col. 24 lines 13-20) such that an equalizer response compensates optimally the determined channel response at said at least one selected frequency point (col. 24 lines 28-30).

Re claim 3, Tapia discloses a method further comprising selecting a number of said at least one frequency point for said channel (col. 25 lines 55-60, P measured points of a frequency spectrum) to correspond to a minimum number which can be expected to result in a sufficient channel equalization (col. 23 lines 35-37).

Re claim 11, Tapia discloses use of the method for a single channel of a single carrier system (col. 11 lines 15-23).

Re claim 15, the claimed limitations recited have been analyzed and rejected with respect to claim 1.

Re claim 17, the claimed limitations recited have been analyzed and rejected with respect to claim 3.

Re claim 25, the claimed limitations recited have been analyzed and rejected with respect to claim 11.

Re claim 29, the claimed limitations recited have been analyzed and rejected with respect to claim 1.

Re claim 31, the claimed limitations recited have been analyzed and rejected with respect to claim 3.

Re claim 39, the claimed limitations recited have been analyzed and rejected with respect to claim 11.

Re claim 43, the claimed limitations recited have been analyzed and rejected with respect to claim 1.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 2, 16, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tapia et al (US5555285) in view of Stonick et al (US5900778).

Re claim 2, Tapia teaches a method wherein determining said channel response (col. 26 lines 7-29, equation 15) comprises determining a channel phase response (col. 26 lines 22-29) and a channel amplitude response for said channel (col. 24 lines 59-63, it would be obvious to determine the amplitude response), and setting at least one adjustable coefficient of said equalizer (col. 23 lines 35-43, col. 24 lines 13-20).

Tapia fails to teach wherein an equalizer amplitude response approaches optimally an inverse of a determined channel amplitude response for all considered frequency points and that an equalizer phase response approaches optimally a negative of a determined channel phase response for all considered frequency points. However Stonick teaches wherein an equalizer amplitude response approaches optimally an inverse of a determined channel amplitude response for all considered frequency points (col. 2 lines 57-60, it is well known that an equalizer is comprised of filters and performs predistortion) and that an equalizer phase response approaches optimally a negative of a determined channel phase response for all considered frequency points (col. 5 lines 14-18).

Therefore taking the combined teachings of Tapia and Stonick as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the steps of Stonick into the method of Tapia. The motivation to combine Stonick and Tapia would be to compensate for non-linear amplitude and phase distortions (col. 3 lines 65-67 of Stonick).

Re claim 16, the claimed limitations recited have been analyzed and rejected with respect to claim 2.

Re claim 30, the claimed limitations recited have been analyzed and rejected with respect to claim 2.

6. Claims 5, 7, 9, 19, 21, 23, 33, 35, and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tapia et al (US5555285) in view of Regalia et al ("The Digital All-Pass Filter: A Versatile Signal Processing Building Block", Proceedings of the IEEE, Vol. 76, No. 1, January 1988, pages 19-37).

Re claim 5, Tapia teaches a method wherein in case said at least one frequency point comprises one frequency point (col. 25 lines 55-60, P measured points of a frequency spectrum) but fails to teach wherein setting said at least one adjustable coefficients comprises for an equalization of phase of said channel setting a complex coefficient of a phase rotator part of said equalizers.

However Regalia teaches wherein setting at least one adjustable coefficients comprises for an equalization of phase of said channel setting a complex coefficient of a phase rotator part of said equalizers (equation 2.6, $e^{j\theta}$ is the complex coefficient of a rotator, as evident in rotator 31 in fig. 3 of applicant's specification).

Therefore taking the combined teachings of Tapia and Regalia as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the steps of Regalia into the method of Tapia. The motivation to combine Regalia and Tapia would be to obtain very robust performance (page 19 right side third paragraph of Regalia).

Re claim 7, Tapia teaches a method wherein in case said at least one frequency point comprises two frequency points (col. 25 lines 55-60, P measured points of a frequency spectrum) but fails to teach setting said at least one adjustable coefficients comprises for an equalization of phase of said channel setting a complex coefficient as a phase rotator part of said equalizer and setting at least one coefficient of a complex all-pass filter part of said equalizers.

Regalia teaches setting said at least one adjustable coefficients comprises for an equalization of phase of said channel setting a complex coefficient as a phase rotator part of said equalizer equalizers (equation 2.6, $e^{j\theta}$ is the complex coefficient of a rotator, as evident in rotator 31 in fig. 3 of applicant's specification) and setting at least one coefficient of a complex all-pass filter part of said equalizers (equation 2.6, page 20 left side sixth paragraph, the filter may be recognized as a complex all-pass filter).

Therefore taking the combined teachings of Tapia and Regalia as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the steps of Regalia into the method of Tapia. The motivation to combine Regalia and Tapia would be to obtain very robust performance (page 19 right side third paragraph of Regalia).

Re claim 9, Tapia teaches a method wherein in case said at least one frequency point comprises two frequency points (col. 25 lines 55-60, P measured points of a frequency spectrum) but fails to teach setting said at least one adjustable coefficients comprises for an equalization of phase of said channel setting a complex coefficient as a phase rotator part of said equalizer, setting at least one coefficient of a complex all-pass filter part of said equalizer, and setting at least one coefficient of a real all-pass filter part of said equalizer.

However Regalia teaches setting said at least one adjustable coefficients comprises for an equalization of phase of said channel setting a complex coefficient as a phase rotator part of said equalizer (equation 2.6, $e^{j\theta}$ is the complex coefficient of a rotator, as evident in rotator 31 in fig. 3 of applicant's specification), setting at least one coefficient of a complex all-pass filter part of said equalizer (equation 2.6, page 20 left side sixth paragraph, the filter may be recognized as a complex all-pass filter), and setting at least one coefficient of a real all-pass filter part of said equalizer (equation 2.6, page 20 left side third and fourth paragraphs).

Therefore taking the combined teachings of Tapia and Regalia as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the steps of Regalia into the method of Tapia. The motivation to combine Regalia and Tapia would be to obtain very robust performance (page 19 right side third paragraph of Regalia).

Re claim 19, the claimed limitations recited have been analyzed and rejected with respect to claim 5.

Re claim 21, the claimed limitations recited have been analyzed and rejected with respect to claim 7.

Re claim 23, the claimed limitations recited have been analyzed and rejected with respect to claim 9.

Re claim 33, the claimed limitations recited have been analyzed and rejected with respect to claim 5.

Re claim 35, the claimed limitations recited have been analyzed and rejected with respect to claim 7.

Re claim 37, the claimed limitations recited have been analyzed and rejected with respect to claim 9.

7. Claims 6, 20, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tapia et al (US5555285) in view of Sifford et al (US4270179).

Re claim 6, Tapia teaches a method wherein in case said at least one frequency point comprises one frequency point (col. 25 lines 55-60, P measured points of a frequency spectrum) but fails to teach setting said at least one adjustable coefficients comprises for an equalization of amplitude of said channel setting a real scaling amplification factor.

Sifford teaches setting said at least one adjustable coefficients (col. 1 lines 33-37 and lines 58-60) comprises for an equalization of amplitude of said channel setting a real scaling amplification factor (col. 1 line 65- col. 2 line 6, col. 4 line 41-43, scaling factor k).

Therefore taking the combined teachings of Tapia and Sifford as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the steps of Sifford into the method of Tapia. The motivation to combine Sifford and Tapia would be to minimize an average error signal (col. 1 lines 55-57 of Sifford).

Re claim 20, the claimed limitations recited have been analyzed and rejected with respect to claim 6.

Re claim 34, the claimed limitations recited have been analyzed and rejected with respect to claim 6.

8. Claims 8, 22, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tapia et al (US5555285) in view of Betts (US5559835).

Re claim 8, Tapia teaches a method wherein in case said at least one frequency point comprises two frequency points (col. 25 lines 55-60, P measured points of a frequency spectrum) but fails to teach setting said at least one adjustable coefficients comprises for an equalization of amplitude of said channel setting at least one coefficient of a symmetric 3-tap Finite Impulse Response filter part of said equalizer.

However Betts teaches setting said at least one adjustable coefficients (col. 4 lines 59-64) comprises for an equalization of amplitude of said channel setting at least one coefficient of a symmetric 3-tap Finite Impulse Response filter part of said equalizer (col. 4 lines 55-59).

Therefore taking the combined teachings of Tapia and Betts as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the steps of Betts into the method of Tapia. The motivation to combine Sifford and Tapia would be to decrease a dither signal (col. 2 lines 18-22 of Betts).

Re claim 22, the claimed limitations recited have been analyzed and rejected with respect to claim 8.

Re claim 36, the claimed limitations recited have been analyzed and rejected with respect to claim 8.

9. Claims 10, 24, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tapia et al (US5555285) in view of Vanderhelm et al (US20030224751).

Re claim 10, Tapia teaches a method wherein in case said at least one frequency point comprises three frequency points (col. 25 lines 55-60, P measured points of a frequency spectrum, it would be obvious to set P equal to three) but fails to teach setting said at least one adjustable coefficients comprises for an equalization of amplitude of said channel setting at least one coefficient of a symmetric 5-tap Finite Impulse Response filter part of said equalizer.

However Vanderhelm teaches setting said at least one adjustable coefficients comprises for an equalization of amplitude of said channel setting at least one coefficient of a symmetric 5-tap Finite Impulse Response filter part of said equalizer (§0072).

Therefore taking the combined teachings of Tapia and Vanderhelm as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the steps of Vanderhelm into the method of Tapia. The motivation to combine Vanderhelm and Tapia would be to remove noise (§0072 of Vanderhelm).

Re claim 24, the claimed limitations recited have been analyzed and rejected with respect to claim 10.

Re claim 38, the claimed limitations recited have been analyzed and rejected with respect to claim 10.

10. Claims 12, 13, 26, 27, 40 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tapia et al (US5555285) in view of Alhava ("Time-Domain Equalizer for Filter Bank-Based Multicarrier Communications", 2002 IEEE, pages 184-188).

Re claim 12, Tapia fails to teach use of the method for each of a plurality of sub-channels of a filter bank based multicarrier system or of a transform based multicarrier system.

However Alhava teaches using an equalization method for each of a plurality of sub-channels (page 184 left side fifth paragraph, OFDM is well known to have multiple sub-channels) of a filter bank based multicarrier system (page 184 right side third paragraph) or of a transform based multicarrier system.

Therefore taking the combined teachings of Tapia and Alhava as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the steps of Alhava into the method of Tapia. The motivation to combine Alhava and Tapia would be to provide resistance against narrowband interference (Abstract of Alhava).

Re claim 13, Tapia fails to teach use of the method for each of a plurality of sub-channels of a filter bank based multiantenna system or of a transform based multiantenna system in a Multiple Input Multiple Output configuration.

However Alhava teaches using an equalization method for each of a plurality of sub-channels (page 184 left side fifth paragraph, OFDM is well known to have multiple sub-channels) of a filter bank based multiantenna system or of a transform based multiantenna system in a Multiple Input Multiple Output configuration (page 184 right side fourth paragraph).

Therefore taking the combined teachings of Tapia and Alhava as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the steps of Alhava into the method of Tapia. The motivation to combine Alhava and Tapia would be to provide resistance against narrowband interference (Abstract of Alhava).

Re claim 26, the claimed limitations recited have been analyzed and rejected with respect to claim 12.

Re claim 27, the claimed limitations recited have been analyzed and rejected with respect to claim 13.

Re claim 40, the claimed limitations recited have been analyzed and rejected with respect to claim 12.

Re claim 41, the claimed limitations recited have been analyzed and rejected with respect to claim 13.

11. Claims 14, 28, and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tapia et al (US5555285) in view of Kabel et al (US20040042557).

Re claim 14, Tapia fails to teach use of the method for channels which are to be processed in an analysis-synthesis filter bank configuration.

However Kabel teaches using an equalization method for channels which are to be processed in an analysis-synthesis filter bank configuration (§0032).

Therefore taking the combined teachings of Tapia and Kabel as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the steps of Kabel into the method of Tapia. The motivation to combine Kabel and Tapia would be to allow high performance signal detection (§0032 of Kabel).

Re claim 28, the claimed limitations recited have been analyzed and rejected with respect to claim 14.

Re claim 42, the claimed limitations recited have been analyzed and rejected with respect to claim 14.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEON-VIET Q. NGUYEN whose telephone number is (571)270-1185. The examiner can normally be reached on Monday-Friday, alternate Friday off, 7:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Leon-Viet Q Nguyen/
Examiner, Art Unit 2611

/David C. Payne/
Supervisory Patent Examiner, Art Unit 2611